REMARKS

Claims 1-18 are all the claims pending in the application. Reconsideration and allowance of all the claims are respectfully requested in view of the following remarks.

Claim Rejections - 35 U.S.C. § 112

- The Examiner rejected claims 1-18 under § 112, 2nd paragraph, as indefinite. The Examiner asserted particular instances of indefiniteness in item 1, pages 2-3 of the Office Action. In order to overcome this rejection, Applicants have amended in part, and traverse it in part as follows.

First, the Examiner asserted that the terms "hard coat film" and "simple substance" are vague. With respect to "hard coat film", Applicants have amended this term throughout the specification and claims to read --coating film--. With respect to "simple substance", Applicants respectfully traverse this rejection because this term would be readily understood by one of ordinary skill in the art. Particularly, one of ordinary skill in the art would understand "simple substance" to mean a substance consisting of atoms of one chemical element, as opposed to an alloy, mixture, or combination of different elements.

Second, the Examiner asserted that the phrase "a ferrous-family metal powder or ... having the same composition as the target as a simple substance or ... of a plurality of metals", as in claim 1, lines 6-7, for example, is unclear. Applicants have amended this phrase, throughout the specification and claims, in a manner believed to overcome this rejection.

Third, the Examiner asserted that the meaning of the term "burned" is unclear. Applicants have amended this term to --heated-- which, from the context of its use, is what one of ordinary skill in the art would have understood it to mean.

Fourth, the Examiner asserted that in claims 1, 3, 10, and 12, the term "base member" lacks antecedent basis, and it is unclear how such is different from the treatment target as a whole. Applicants have amended the first recitation in each of claims 1, 3, 10, and 12, to read "a

base member" to thereby set forth this element for the first time. Further, the term "base member" applies to the treatment target 2 before any coating film 13 has been applied thereto. See, for example, Fig. 3(a). Then, after a coating film 13 has been applied to the base member of the treatment target 2, the treatment target includes the base member and coating film, wherein further discharge from the electrode 12 serves to thicken the coating 13. See, for example, Fig. 3(b). See, also, the specification at the paragraph bridging pages 24 and 25.

Lastly, the Examiner asserted that claims 2 and 11 apparently inconsistently set forth, in their bodies, a step of a discharge surface treatment that takes place after the hard coat film has already formed, whereas their preambles concern the film formation. Applicants submit that, in this regard, the claims are clear as written. As noted above, a first discharge takes place to form a hard coat film 13 on a base member of a treatment target 2. Again, see Fig. 3(a). Then, to thicken the hard coat film, another discharge is performed on the hard coat film 13 that is already formed on the base member of the treatment target, i.e., the treatment target in the second instance includes both the base member and the hard coat film formed thereon. Again, see Fig. 3(b). Accordingly, the preamble in claims 2 and 11 is generic to both discharge treatments. Accordingly, the preamble and body in each of claims 2 and 11 are not inconsistent with one another.

- The Examiner rejected claims 1-18 under § 112, 1st paragraph, as containing subject matter not described in the specification in such a way as to reasonably convey to one skilled in the art, at the time the application was filed, had possession of the claimed invention. Specifically, the Examiner asserted that the substitution of "burning" for "sintering" appears to include new matter. Applicants respectfully traverse this rejection for the following reasons.

First, Applicants have amended the specification and claims to change "burning" to --heating--. This change is supported by the specification as originally filed, at the paragraph bridging pages 20 and 21. Specifically, the specification describes that the method of

manufacturing the electrode 12 is by mixing powders, compressing and molding the mixture into a predetermined shape, and then

> "put[ting them] into a vacuum furnace, etc., and the temperature inside the furnace is gradually increased so as to harden the green compact electrode to a degree ... and also is not hardened too much (this process is referred to as 'preliminary sintering process'). In this state, the ferrous-family metal such as Co starts to elute to be buried in gaps between carbides, thereby forming a so-called solid solution. In contrast, ... a main sintering process is not attained."

Thus, it is clear from the original specification that a full sintering process is not desired; instead, a "preliminary sintering process", or incomplete sintering, is performed. Thus, use of the term "sintering" appears to be incorrect. Further, due to the manner in which the process is described, i.e., placing the electrode in a furnace and gradually increasing the temperature to a certain point, it is equally as clear that a "heating" process is described. Accordingly, changing the term "burning" to --heating-- more clearly defines the process originally described, and does not add new matter.

Claim Rejections - 35 U.S.C. §§ 102/103

- The Examiner rejected claims 1-3 and 7-12 under § 102(b) as anticipated by or, in the alternative, under § 103(a) as being obvious over JP 08-300227a to Saito et al. (hereinafter Saito '227). Applicants respectfully traverse this rejection because Saito '227 fails to disclose, teach or suggest all the elements as set forth in Applicants' claims.

Saito '227 discloses a method in which a green compact such as carbide is compressed and molded, and preliminarily sintered at a temperature not more than the sintering temperature to form an electrode. However, in this method, it is necessary to carry out the preliminary sintering process at a comparatively high temperature since, after having been subjected to a discharging surface treatment, the resulting hard coat film is further subjected to a hardening process with the processing pole changed, and in this reference, the electrode is held at 1100 degree centigrade for 30 minutes (Table 1). However, in such a preliminary sintered green

compact electrode, since condensation progresses due to the sintering in a liquid phase, it is difficult to carry out a secondary machining process on the electrode, and the deposition process of the hard coat film onto the treatment subject is inefficient, resulting in degradation in the quality of the hard coat film. Moreover, it is necessary to carry out the process for a long time in order to form a dense coating film. Furthermore, another disadvantage is that the process tends to change from a surface treatment on the treatment subject, into an engraving discharge process for removing the treatment subject.

In contrast, each one of independent claims 1-3 and 10-12 discloses that a powder is mixed with a ferrous-family metal powder, or a non-ferrous metal powder, as a simple substance or a combination of a plurality of metals, wherein the powder is formed by a simple substance or a combination of a plurality of carbides of metals belonging to the IVa, Va and VIa families in the Periodic Table, wherein the non-ferrous metal powder has the same composition as the treatment target, and further wherein the powder mix is compressed and molded, and then heated at a temperature at which the ferrous-family or non-ferrous metal powder starts to melt to form an electrode serving as a discharge processing electrode, and electrical conditions—at a time when a coating film that has been formed on the base member is subjected to a discharging surface treatment—are altered according to the characteristics of the treatment target material. Thus, this arrangement makes it possible to easily form an electrode and also to form a thick, hard coat film within a desired area efficiently. See, for example, Fig. 3(b) and the associated description. Therefore, this arrangement is suitable for various machine parts such as metal molds, tools and machine essential parts.

With respect to the manufacturing method for "the electrode that is heated at a temperature at which the ferrous-family or non-ferrous metal powder starts to melt, after having been compressed and molded" is supported by the description on page 21 line 20 and thereafter in the specification as filed. There, it says:

> "A powder that is formed by a simple substance or a combination of a plurality of carbides of metals belonging to the IVa, Va and VIa families in the Periodic Table (for example, WC, TiC, TaC, etc.) is mixed ferrous-family metal powder such as Fe, Co and Ni, or non-ferrous metal powder having the same

composition as the treatment target (for example, Al alloy powder, etc.) as a simple substance or in combination, and this is compressed and molded into a predetermined shape, thereby manufacturing a green compact electrode. Then, this is put into a vacuum furnace, etc., and the temperature inside the furnace is gradually increased so as to harden the green compact electrode to a degree, for example, approximately as hard as chalk so that it has sufficient strength to withstand a mechanical machining process and also is not hardened too much (this process is referred to as "preliminary sintering process"). In this state, the ferrous-family metal such as Co starts to elute to be buried in gaps between carbides, thereby forming a so-called solid solution. In contrast, at contact portions between the carbides, although mutual bonding progresses, the bonding is weak because the sintering temperature is comparatively low with the result that a main sintering process is not attained. The sintered electrode in this state, which has been subjected to the preliminary sintering process, is taken out, and machined and sized to a predetermined shape. Thus, this is used as the sintered electrode 12."

As described above, each one of claims 1-3 and 10-12 of the present invention discloses an arrangement in which a powder that is formed by a simple substance or a combination of a plurality of carbides of metals belonging to the IVa, Va and VIa families in the Periodic Table is mixed with a ferrous-family metal powder or non-ferrous metal powder having the same composition as the treatment target as a simple substance or a combination of a plurality of metals, and this is compressed and molded, and then heated at a temperature at which the ferrous-family or non-ferrous metal powder starts to melt to form an electrode serving as a discharge processing electrode. In contrast, Saito '227 neither discloses, teaches nor suggests the arrangement that "after having been compressed and molded, the material is heated at a temperature at which the ferrous-family or non-ferrous metal powder starts to melt to form an electrode serving as a discharge processing electrode.

Moreover, in claims 1-3 and 10-12 of the present invention, electrical conditions at the time when a coating film—that has been formed on a base member—is subjected to a discharging surface treatment are altered in accordance with the characteristics of the treatment subject material (that is, the treatment subject and/or the coating film). In contrast, with respect to the alteration of the electrical conditions, Saito '227 simply discloses that an electrode is

consumed in a primary process to form a hard coat film on a treatment subject, that in a secondary process the hard coat film formed on the treatment subject is refused without consuming the electrode, and that the polarities in the primary process and the secondary process are exchanged. Consequently, different from that set forth in claims 1-3 and 10-12 of the present invention, Saito '227 does not disclose anything about altering the electrical conditions at the time when a coating film—that has been formed on a base member—is subjected to a discharging surface treatment, let alone that they are altered in accordance with the characteristics of the treatment subject material. Moreover, claims 1-3 and 10-12 of the present invention have the arrangement in which the resulting effect is that a thick, hard coat film is efficiently formed on a treatment subject. And Saito '227 does not disclose anything about these functions and effects.

As described above, claims 1-3 and 10-12 of the present invention are clearly distinct from Saito '227 in structure, as well as in function and effect. Therefore, Saito does not anticipate, or render obvious, any of claims 1-3 and 10-12.

- The Examiner rejected claims 4-6 and 13-15 under §103(a) as being unpatentable over Saito '227 and further in view of JP 2-246542A to Mori (hereinafter Mori), or JP 63-210280A to Inoue (hereinafter Inoue), or US 6,086,684 to Saito et al. (hereinafter Saito '684).

Mori discloses a method in which a machining process is carried out by utilizing plasma in a gas atmosphere such as an inert gas. In contrast, claims 4 to 6 of the present invention, which are respectively dependent on claims 1 to 3, disclose an arrangement in which an inert gas is interpolated between the electrode and the treatment subject. This arrangement provides a function and effect that the device structure is simplified. In the same manner, claims 13-15 of the present invention, which are respectively dependent on claims 10-12, disclose an arrangement in which an inert gas is interpolated between the electrode and the treatment subject. Again, this arrangement provides a function and effect that the device structure is simplified. Moreover, Mori fails to teach or suggest anything about the electrical conditions as set forth in Applicants' claims.

The Examiner cites Inoue and Saito '684 as teaching various characteristics of the gas environment around the discharge electrode. But neither Inoue nor Saito '684 teaches or suggests anything concerning the electrical conditions as set forth in Applicants' claims.

Accordingly, for the sake of argument, even assuming that one of ordinary skill in the art were motivated to combine Saito '227 with any of Mori, Inoue, or Saito '684 as suggested by the Examiner, any such combination would still fail to teach or suggest all the elements as set forth in Applicants' claims.

- The Examiner rejected claims 7-9 and 16-18 under §103(a) as being unpatentable over Saito '227 and further in view of JP 10-225824A to Kaguku (hereinafter Kaguku), JP 10-512A to Saito et al. (hereinafter Saito '512) or JP 5-261624 A to Toshiba Tungaloy Co. (hereinafter Toshiba). Applicants respectfully traverse this rejection because these references fail to teach or suggest all the elements as set forth in Applicants' claims.

Saito '512 discloses a method and a device for relatively shifting a rotation tool and a surface treatment electrode, and Toshiba discloses a driving mechanism for relatively shifting a rotation electrode with respect to a treatment subject. In contrast, claims 7-9 of the present invention, which are respectively dependent on claims 1-3, disclose an arrangement for allowing an electrode to scan a treatment subject. Therefore, in addition to the functions and effects of claims 1-3 of the present invention, the following functions and effects are obtained: it is possible to use a small-size sintered electrode, and the process is carried out with this electrode being allowed to scan; it is not necessary to use a large-size sintered electrode having a specific shape, and it is possible to form a coating film with the small-size sintered electrode being allowed to scan on the entire curved face of the treatment subject, such as a mold, having a three-dimensional free curved face, so as to have a uniform thickness over the entire area or a varied film thickness, if necessary. In the same manner, claims 16-18 of the present invention, which are respectively dependent on claims 10-12, disclose an arrangement for allowing an electrode to scan a treatment subject in addition to the arrangement of claims 10-12. Thus, these claims exert the same functions and effects as claims 7-9 of the present invention, in addition to the functions

and effects of claims 10-12 of the present invention. Moreover, Saito '512 fails to teach or suggest anything about the electrical conditions as set forth in Applicants' claims.

Further, the Examiner cites Kaguku, Saito '512, and Toshiba, as teaching the use of X, Y, and Z movements to enable electrical discharge machining of 3-D objects.[1] But Kaguku, Saito '512, and Toshiba do not teach or suggest anything concerning the electrical conditions as set forth in Applicants' claims.

Accordingly, for the sake of argument, even assuming that one of ordinary skill in the art were motivated to combine Saito '227 with any of Kaguku, Saito '512, or Toshiba, as suggested by the Examiner, any such combination would still fail to teach or suggest all the elements as set forth in Applicants' claims.

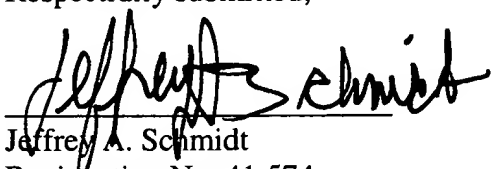
Conclusion

In view of the above, reconsideration and allowance of this application are now believed to be in order, and such actions are hereby solicited. If any points remain in issue which the Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned at the telephone number listed below.

[1] Office Action at the paragraph bridging pages 7 and 8.

The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

Respectfully submitted,



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